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RMO  
UNITED STATES DEPARTMENT OF AGRICULTURE

## FOREST SERVICE

RS  
Pf-1  
Use of Water

Berkeley, California  
June 8, 1934

### STORING RAIN WATER FOR ANGELES NATIONAL FOREST

By

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OCT 22 2013

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Annex 1  
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June 8, 1934

PROJECT: Storing Rain Water for Angeles Forest

A. General

Annual rainfall - Normal, 10 inches  
Storage - 7,500 gallons of water

$$\frac{7500}{7.47} = 1,000 \text{ cu. ft., approximately}$$

Assume a catchment 40' x 40' square and 7.5" or 75% of normal rainfall collected.

$$40 \times 40 \times \frac{7.5}{12} = 1,000 \text{ cu. ft. of water}$$

B. Catchment Reinforced concrete slab 3" thick

Location: Side hill of a slope at least  $1\frac{1}{2}$ " (inches) per foot and reasonably smooth.

1. Concrete catchment

(a) 3" concrete slab 40' x 40'

$$40 \times 40 \times \frac{3}{12} = 400 \text{ cu. ft.}$$

(b) 6" wall on lower end 12" high 37' long

$$\frac{6}{12} \times 1 \times 37 = 18.5 \text{ cu. ft.}$$

(c) Concrete settling basin 3' x 3' x 12" deep.

$$1 \text{ wall } 6" \times 24" \times 3' \text{ long} = \frac{6}{12} \times \frac{24}{12} \times 3 = 3.00 \text{ cu. ft.}$$

$$2 \text{ walls } 6" \times 18" \times 3.5' \text{ long} = 2 \times \frac{6}{12} \times \frac{18}{12} \times 3.5 = 5.25 \text{ cu. ft.}$$

$$1 \text{ wall } 6" \times 18" \times 4' \text{ long} = \frac{6}{12} \times \frac{18}{12} \times 4 = 3.00 \text{ cu. ft.}$$

$$1 \text{ floor } 3' \times 3' \times 6" \text{ deep} = 3 \times 3 \times \frac{6}{12} = 4.50 \text{ cu. ft.}$$

$$\text{Total} - 15.75 \text{ cu. ft.}$$

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Concrete for catchment and settling basin:

$$\begin{aligned}(a) &= 400.00 \text{ cu. ft.} \\(b) &= 18.50 \text{ " " } \\(c) &= 15.75 \text{ " " } \\ \text{Total} &= \frac{434.25}{27} \text{ cu. ft. or } \frac{434.25}{27} = 16.1 \text{ cu. yds.}\end{aligned}$$

Mixture 1: 2.0 : 5 concrete \$4.50 per cu. yd.

$$16.1 \times \$4.50 = \$72.50$$

2. Reenforcing wire

(a) Catchment

Poultry netting 2" diamond mesh galvanized #20 gauge wire.

150 foot roll 60" wide - \$3.50

3 rolls required -  $3 \times 3.50 = \$10.50$

(b) Settling basin and wall

Expanded metal reenforcement 3" mesh

Stubs gauge No. 12

Wall -  $2' \times 37' = 74 \text{ sq. ft.}$

Settling basin = 36 sq. ft.

Total-110 sq. ft.

Expanded metal at 2¢ per sq. ft.

$$110 \text{ sq. ft.} \times .02 = \$2.20$$

Total cost of reenforcing wire:

$$\begin{aligned}(a) &- \$10.50 \\(b) &- \frac{2.20}{\$12.70}\end{aligned}$$

3. Expansion joints of 1" x 4" redwood lumber, 6 lengths 40' long.

$$6 \times 40 \times \frac{1" \times 4"}{12} = 80 \text{ board feet}$$

Rough redwood lumber at \$25 per M

$$\frac{80}{1000} \times 25 = \$2.00$$

4. Strainer: 3" cast iron screwed fitting to fit 3" Std.  
pipe - - - - - \$5.00
5. Water proofing: Layhold or equivalent  
30 gals. at 30¢ per gallon - \$9.00
6. Total cost of catchment and settling basin:

Item 1.	Concrete - - - - -	\$72.50
" 2.	Reenforcing - - - - -	12.70
" 3.	Lumber - - - - -	2.00
" 4.	Strainer - - - - -	5.00
" 5.	Water proofing - - - - -	9.00
	Total - - - - -	\$101.20

C. Concrete storage tank 11' diameter x 11" high - capacity, 7,500 gallons, approximately.

1. Concrete

$$\begin{array}{ll}
 \text{Wall} & \frac{\pi}{4} (12^2 - 11^2) \times 11 = 199.0 \text{ cu. ft.} \\
 \text{Floor} & \frac{11}{12} \frac{\pi}{4} 12^2 = 103.6 \text{ cu. ft.} \\
 \text{Foundation} & \frac{\pi}{4} (12^2 - 10^2) \times \frac{12}{12} = 34.5 \text{ cu. ft.} \\
 \text{Roof} & = \frac{59.4 \text{ cu. ft.}}{396.5 \text{ cu. ft.}}
 \end{array}$$

$$\frac{396.5}{27} = 15 \text{ cubic yards, approximately}$$

$$\begin{array}{l}
 \text{Mixture 1 : 20 : 4.0 at \$4.80 per cu. yd.} = \\
 15 \times 4.80 = \$72.00
 \end{array}$$

2. Reenforcing steel 3/8" and 1/2"  $\phi$  bars

(a) Roof - 3/8"  $\phi$  bars spaced 6" o.c. both ways = 450 ft.

(b) Circumferential:

$$\begin{array}{l}
 5 \text{ rings } 3/8" \phi \text{ rods } 11' - 9" \text{ diameter} \\
 5 \times 11.75 \times \pi = 185 \text{ feet}
 \end{array}$$

$$\begin{array}{l}
 12 \text{ rings } 1/2" \phi \text{ rods } 11' - 9" \text{ diameter} \\
 12 \times 11.75 \times \pi = 440 \text{ feet}
 \end{array}$$

(c) 25 vertical 3/8"  $\phi$  rods 18" o.c. 13 feet long

$$25 \times 13 = 325 \text{ feet}$$



(d) Bottom  $\frac{1}{2}$ "  $\phi$  rods = 700 feet

(e) 36 radial  $\frac{3}{8}$ "  $\phi$  bars, 36 x 4.5' = 160 feet

Total reinforcing -

$\frac{3}{8}$ " $\phi$ rods 1120' at 0.376 lb. per foot	422 lbs.
$\frac{1}{2}$ " $\phi$ rods 1140' at 0.668 lb. per foot	762 "
	<u>1184 lbs.</u>

Reinforcing steel at 2¢ per lb.

.02 x 1184 = \$23.68 say \$24.00

### 3. Tank fittings

#### (a) Overflow pipe:

1 - 3" wrought iron nipple 16" long	- - -	1.50
1 - 3" Std. malleable iron elbow	- - -	1.50
1 - 3" wrought iron coupling	- - - - -	.60

#### (b) Inlet:

1 - 3" wrought iron nipple 16" long	- - -	1.50
1 - 3" wrought iron coupling	- - - - -	.60
1 - 3" C.I. Std. flange union	- - - - -	1.50

#### (c) Outlet:

1 - 3" wrought iron nipple 16" long	- - -	1.50
1 - 3" wrought coupling	- - - - -	.60
1 - 3" C.I. Std. flange union	- - - - -	1.50
Total	- -	<u>\$10.80</u>

### 4. Water proofing: Layhold or equivalent

15 gallons at 50¢ per gallon - - - - \$4.50

### 5. Total cost of concrete tank

Item 1. Concrete	- - - - -	\$72.00
" 2. Steel	- - - - -	24.00
" 3. Fittings	- - - - -	10.80
" 4. Water proofing	- - -	4.50
Total	- -	<u>\$111.30</u>

### D. 3" Hydrant

1-Std. Hose gate valve with brass cap and chain - - - \$20.00

### E. Pipe

The cost of the pipe used to connect catchment with the storage tank and the tank to the hydrant at the road depends on the respective locations of the three. Average system would require about 100 ft. of 3" pipe at 28¢ per foot - - - - - \$28.00

F. Total cost for material

Catchment and settling basin - - - - -	\$101.20
Concrete storage tank and fittings - - - - -	111.30
3" Hose hydrant - - - - -	20.00
100 feet of 3" Std. pipe - - - - -	<u>28.00</u>
Total - - - - -	\$260.50

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